

**DEPARTMENT OF TRANSPORTATION**

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September 2, 2011

Bimla Rhinehart  
Executive Director  
California Transportation Commission  
1120 N Street  
Room 221 (MS-52)  
Sacramento, CA 95814

Dear Ms. Rhinehart:

The California Department of Transportation (Department) supports the Bay Area Infrastructure Financing Authority's (BAIFA) application to the California Transportation Commission (CTC) for the Bay Area Express Lanes Public Partnership Application For High Occupancy Toll Lanes. BAIFA is a joint exercise of powers agency formed by the Metropolitan Transportation Commission (MTC) and the Bay Area Toll Authority seeking authority as a regional transportation agency, by the consent of MTC, to develop and implement a high occupancy toll facility.

The application was developed by the MTC in cooperation with the Department for BAIFA to request the determination of eligibility, pursuant to the Section 149 of the Streets and Highway Code, for an Express Lanes Facility. The proposed Express Lanes Facility would consist of about 265 directional miles of express lanes, including 149 miles of existing HOV lanes to be converted to express lanes, and 116 miles of new express lanes. The Express Lanes Facility is comprised of five freeway routes: I-80 in Alameda, Contra Costa and Solano Counties, I-680 in Contra Costa and Solano Counties, I-880 in Alameda County, SR-84 in Alameda County and SR-92 in Alameda County. The proposal also includes a 19.9 directional mile gap on I-880 for which tolling is not anticipated in the near future. Operational strategies will be employed to enhance mobility on this segment instead. The Express Lanes Facility, when combined with other corridors that already have statutory authority for express lanes, would constitute an Express Lane "Network".

The primary goal of the proposed Express Lanes Facility is to help optimize the freeway system management and traffic operations by making use of the available unused capacity in the HOV lanes. Additionally, the Express Lanes Facility would aid in expediting completion of the region's entire HOV lane network, encompassing other currently authorized corridors in the region, to alleviate congestion for all freeway users.

Caltrans District 4 has approved a Project Study Report (PSR) for a “backbone” set of freeway corridors for which express lanes were considered. The Express Lanes Facility submitted in this application is a subset of the “backbone” network. The PSR is programmatic and precedes development of individual project initiation documents and the Project Approval and Environmental Document phase for individual corridors of the proposed network.

In parallel with development of the programmatic PSR, the Department completed a qualitative assessment of the traffic operational benefits of the proposed “backbone” network, including the Express Lane Facility. As you will notice in the attached, the Department has determined that:

- In spite of their effectiveness in providing significant travel time savings, portions of the existing 420 miles of HOV lanes in the San Francisco Bay Area are not being fully utilized. Additionally, the 800 mile HOV network historically envisioned for the Bay Area includes 113 miles of programmed and 267 miles of unfunded HOV lanes which will remain discontinuous due to right-of-way and funding challenges, and thus, not optimized to allow the lanes to reach their full capacity.
- Some existing HOV lanes are near capacity. Once these lanes reach their capacity, their effectiveness in terms of providing travel time savings to users will diminish. In order to ensure continued travel time saving for transit users and carpoolers, either additional capacity, if deemed feasible, will need to be added or the vehicle occupancy requirement will need to be increased. It is expected that a change in the minimum carpool eligibility requirements would result in increased traffic volumes in the adjacent general purpose lanes and would accompany additional congestion, at least initially while the intended increase in usage of transit and ridesharing take effect. Tolling and Express lane operations can help reduce this impact by allowing solo drivers access to the carpool lane, not only reducing demand and congestion in the adjacent lanes but also helping attain optimum efficiency and full capacity of the system. Such changes are expected to be applied incrementally over time and on a corridor by corridor basis upon detailed analyses of needs, and as needed to maintain the integrity of carpool operations starting from 2020.
- The proposed Express Lanes Facility operations will serve as a complementary and an effective tool for real-time multimodal system management operations, adding benefits due to connectivity afforded by extending and closing existing gaps in the HOV network as well as increased efficiency due to full utilization of the unused capacity in the HOV lanes. Given the qualitative assessment and the programmatic approach, the exact benefits cannot be quantified at this time; however, the resultant mobility benefits are expected to be significant.
- The proposed Express Lanes Facility will be consistent with the established standards, requirements, and limitations that apply to those facilities in Sections 149, 149.1, 149.3, 149.4, 149.5, 149.6 and 149.7 of the Streets and Highways Code. The network will be integrated with and complement the previously authorized Express Lanes in Alameda and Santa Clara Counties, on Interstates 580 and 680, U.S. 101, and State Routes 237 and 85.

- Full effectiveness of the proposed Express Lanes Facility will be realized via inclusion of certain design considerations and operational criteria. These include careful selection of access, operational hours, carpool eligibility, dynamic pricing, and network consistency, in addition to uniform tolling and customer service, integration with toll collection and metering operations at Bay Area toll bridges and re-investment of revenues. It is expected that these criteria will be met through appropriate cooperative agreements and memoranda of understanding among appropriate stakeholders, including the Department, MTC, the California Highway Patrol, and other stakeholders.

In closing, the proposed Bay Area Express Lanes Facility is consistent with State Highway System requirements and with the established standards, requirements, and limitations that apply to those facilities in Sections 149, 149.1, 149.3, 149.4, 149.5, 149.6, and 149.7 of the Streets and Highways Code. It is also consistent with the Department's Traffic Operations Program goals, including preserving safety, enhancing mobility, real-time multimodal transportation system management, and providing choice and control for travelers. In addition, the Express lanes network also allows the Department to engage in innovative solutions, potentially involving public-private sector partnerships, in addressing transportation needs and challenges.

Sincerely,



BIJAN SARTIPI  
District Director

Attachment: Traffic Operational Assessment, San Francisco Bay Area Express Lanes Network dated August 31, 2011

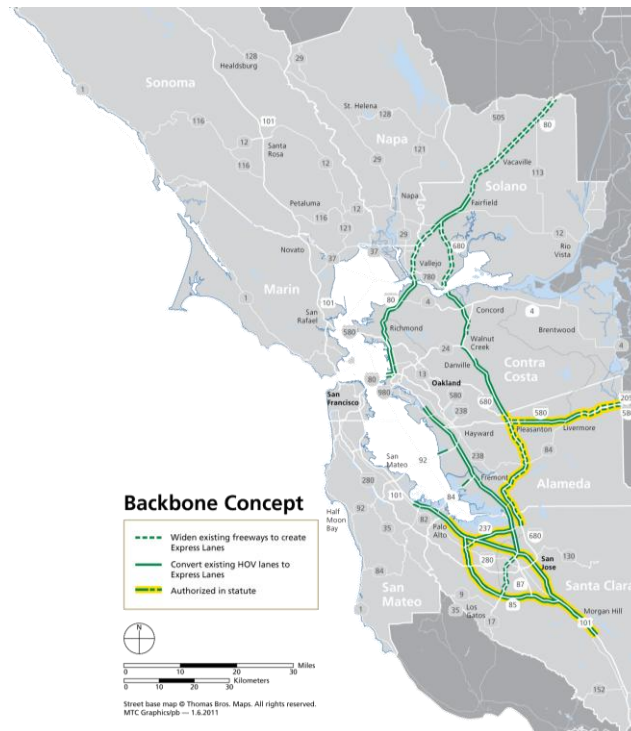
Cc: Steve Heminger – Executive Director, MTC

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# Traffic Operational Assessment

## SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

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August 31, 2011

California Department of Transportation  
District 4 – Office of Highway Operations

## SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

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### **I. INTRODUCTION**

This evaluation focuses on the potential traffic operational benefits, i.e., congestion reduction and mobility to convert existing and programmed High Occupancy Vehicle (HOV) lanes in the San Francisco Bay Area to a backbone (High Occupancy Toll or) Express Lanes Network. The need for this evaluation has arisen as part of a current proposal by the Metropolitan Transportation Commission (MTC) and the Bay Area Infrastructure Financing Authority is to get authorization for conversion of HOV to Express lanes on five below corridors hereinafter referred to as the “Facility”:

- Interstate 80 in Alameda, Contra Costa, and Solano Counties
- Interstate 680 in Contra Costa and Solano Counties
- Interstate 880 in Alameda County
- SR 84 in Alameda County
- SR 92 in Alameda County

A programmatic Project Study Report for the backbone Network that includes this Facility has been completed by the MTC and approved by Caltrans. Future implementation of all individual elements of the Express Lane Network will be subject to detailed analyses and approval on appropriate corridor level bases, assuring further safety and operational evaluations before actual implementation. Also, while mindful of other influencing factors, such as market and consumer acceptance, pricing, or revenue generation, this evaluation purposely does not intend to assess the financial feasibility of the Express Lanes.

### **II. BACKGROUND**

#### **Existing HOV Lanes Network:**

The San Francisco Bay Area has a population of over seven million people and consists of nine counties: San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, Napa, Sonoma, and Solano. The region’s highway network has consistently been ranked as one of the most congested in the nation, and peak period congestion is expected to grow in the future. An extensive network of HOV lanes is currently in place to reduce solo commuting by encouraging ridesharing and transit use.

Currently, there are about 420 lane-miles of HOV lanes in the San Francisco Bay Area. The first HOV lanes in the Bay Area were constructed in 1970’s. However, the major expansion of the system started in early 1980’s when Santa Clara County residents approved a tax measure to build HOV lanes on all major freeways in the South Bay.

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Since then, HOV lanes in the other counties of the Bay Area have been constructed in accordance with the HOV Lane Master Plan that envisions an 800 lane-miles network in the Bay Area.

HOV lanes in the Bay Area have design and operational characteristics that differ from HOV facilities in Southern California. HOV lanes in this region are operated contiguous with general purpose lanes and have continuous unlimited access into and out of the lane, with no buffer (neither physical nor striped) separating them from the adjacent lanes. The lane restrictions are in effect only during weekday commute periods (e.g. 5-9 a.m. and 3-7 p.m.). During off-peak periods and on weekends, the lanes are open to all traffic. Because HOV lanes in this region have historically been operated in this manner, these factors will be considered in the operational and design approach to a Bay Area Express Lane network.

Bay Area HOV lanes continue to be well-utilized and offer time savings. The average peak hour speed in the HOV lane is about 61 mph, compared to average speed of general purpose lanes of about 43 mph. The effective capacity of the HOV lane is about 1650 - 1700 vehicles per hour (vph). According to the HOV lane report for calendar year 2009 ([http://www.dot.ca.gov/dist4/highwayops/docs/hov\\_report\\_2009.pdf](http://www.dot.ca.gov/dist4/highwayops/docs/hov_report_2009.pdf)), the majority of the HOV lanes in the Bay Area have surplus unused capacity, even during the highest hour of the commute. Because HOV usage is less in the shoulder hours of the peak period, more unused capacity is available at hours immediately preceding or succeeding the peak.

In spite of their effectiveness in providing significant travel time savings, on average, the existing HOV lanes are not being fully utilized in capacity, and the network remains discontinuous due to right-of-way and funding challenges.

#### **Proposed Backbone Express Lanes Network:**

Prior legislation allows implementation of Express lanes in four corridors in the Bay Area, consisting of two in Alameda County (Interstates 580 and 680) and two in Santa Clara County (State Route 85/ U.S. 101 and State Route 237). HOV lanes are already in operation in those corridors except for northbound I-680. An Express lane has been in operation on southbound I-680 from Route 237 to Route 84 in Alameda and Santa Clara Counties since September 2010.

The proposed backbone Express Lanes Network would consist of about 533 miles of Express lanes, including 345 miles of existing and under development HOV lanes to be converted to Express lanes, and 188 miles of new Express lanes. The primary goal of the proposed network is to help optimize the freeway system management and traffic operations. By making use of the available unused capacity in the HOV lanes, and

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expediting completion of the entire network, congestion for all freeway users could be reduced.

Tolls will vary dynamically based on traffic volumes and congestion in the Express lane and in the adjacent general purpose lanes. Higher tolls will be assessed during peak commute hours when available unused capacity is limited and will be lowered at other times. Peak spreading can be achieved by encouraging modal and temporal shifts to other hours of the peak, further reducing the magnitude of congestion.

Revenue generated by these lanes can help close the HOV gaps and increase corridors reliability for HOV lanes and help reduce congestion overall. Express lanes and toll lanes have been in operation in the southern California but the only Express lane currently operating in the Bay Area is a 14-miles segment of southbound I-680 between Route 84 in Alameda County to Route 237 in the Santa Clara County. The benefit provided by this Express lane is currently being evaluated as there has not been enough time to allow for the respective traffic operational patterns to stabilize.

Allowing toll paying solo-drivers in the HOV lanes, when there is available unused capacity, facilitates optimization of the freeway system; thus, reducing congestion in mixed flow lanes. Carpoolers and transit will continue to enjoy travel time savings (and potentially cost savings over solo drivers). The proposed network will be dynamically priced to ensure continued optimum travel time savings for the ridesharing and transit in the lane converted from HOV to Express. Collected revenues will be applied towards operating and maintaining the system as well as the completion of the network which in turn will further promote ridesharing and transit through yet more travels time savings and reliability.

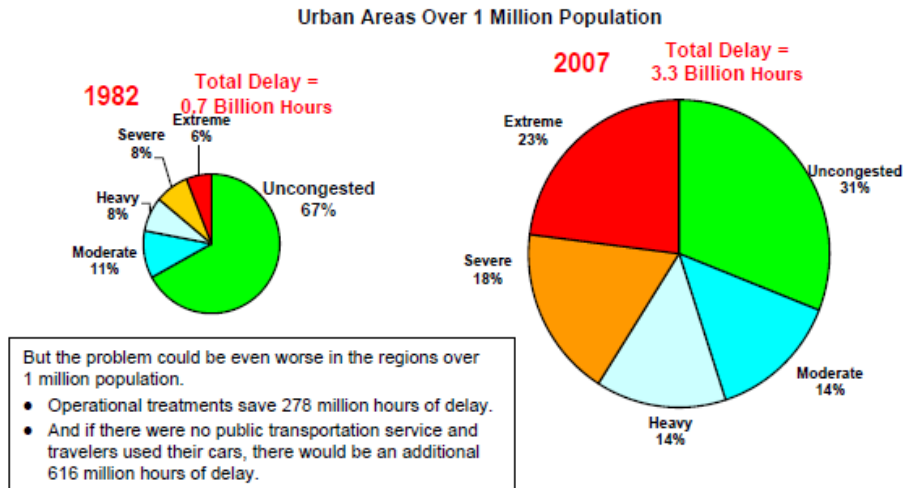
### **U.S. & California Congestion Trends:**

According to the 2009 Urban Mobility Report (UMR) by Texas Transportation Institute, nationwide congestion of the metropolitan area has grown significantly from 1982 with 0.7 billion hours of delay to 3.3 billion hours of delay in 2007.

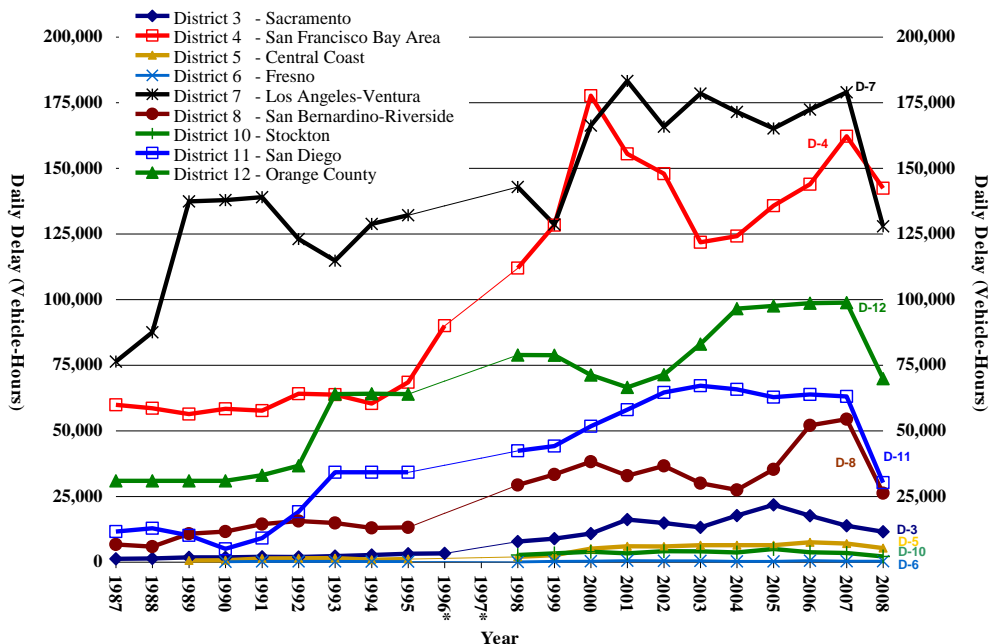


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Consistent with national trends, congestion has been on the increase from 1987 to 2007 in California and the Bay Area. In 2008 and 2009 the Bay Area and statewide congestion dropped slightly due to reduction in employment rate and the general slowing of economy.

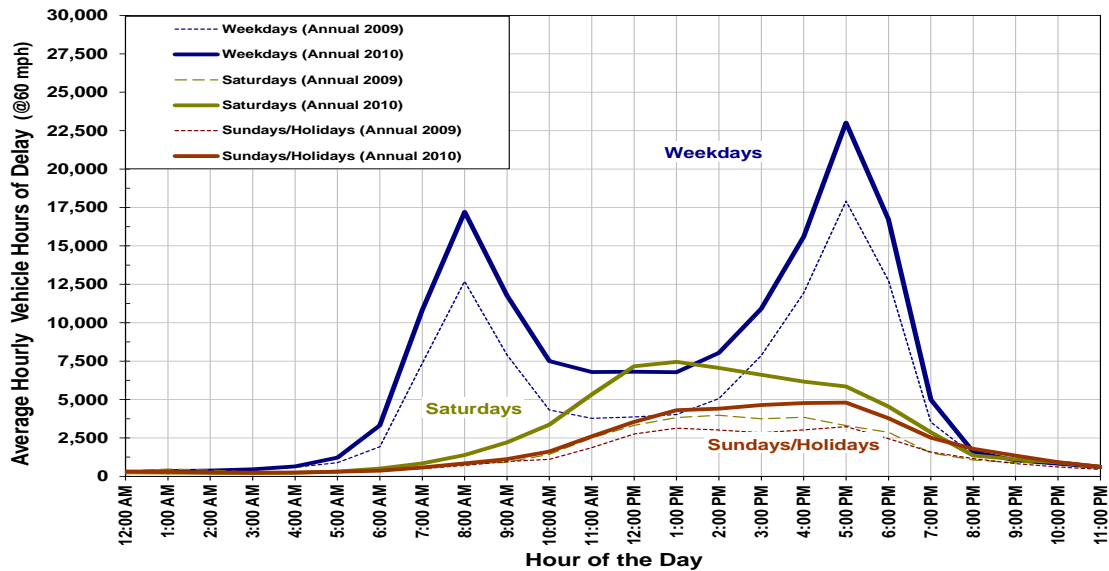


A preliminary comparison of data recently obtained from the California Performance Measurement System (PeMS) revealed that the slight reduction in congestion seen in 2008 and in 2009 has since reversed with increasing daily congestion recorded in 2010.



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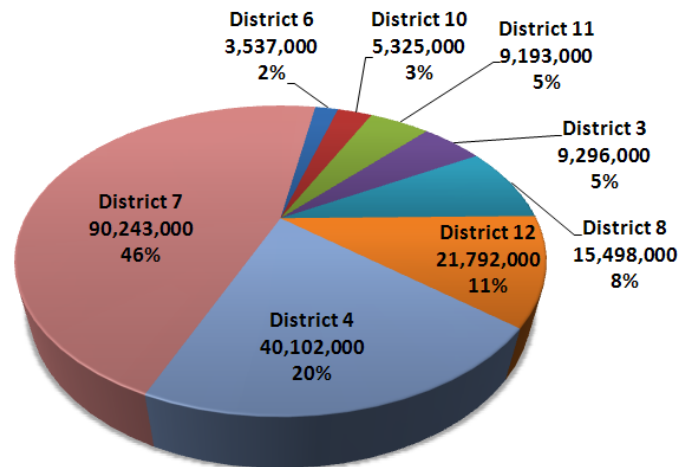
Bay Area Average Delay by Hour & Day per Week  
(Congestion in 2010 has increased compare to 2009)



### Congestion in the San Francisco Bay Area:

In 2009, the Bay Area commuters experienced an annual congestion of about four million hours of delay. As depicted below, based on data collected via PeMS, this, on average, is about 20% of the total statewide congestion on California freeways and highways.

2009 Statewide Congestion  
(Total Annual vehicle-hours of delay based on 60 mph threshold)



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# Traffic Operational Assessment

## SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

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The Bay Area annual congestion data for each county and the top 20 most congested locations are shown below. The Alameda County retained the number one congestion ranking followed by Santa Clara, Contra Costa, San Francisco, San Mateo, Solano, Sonoma, Marin, and Napa Counties. At the same time the Vehicle Miles Traveled (VMT) is also increased from 2009 to 2010, an indication of higher transportation demand.

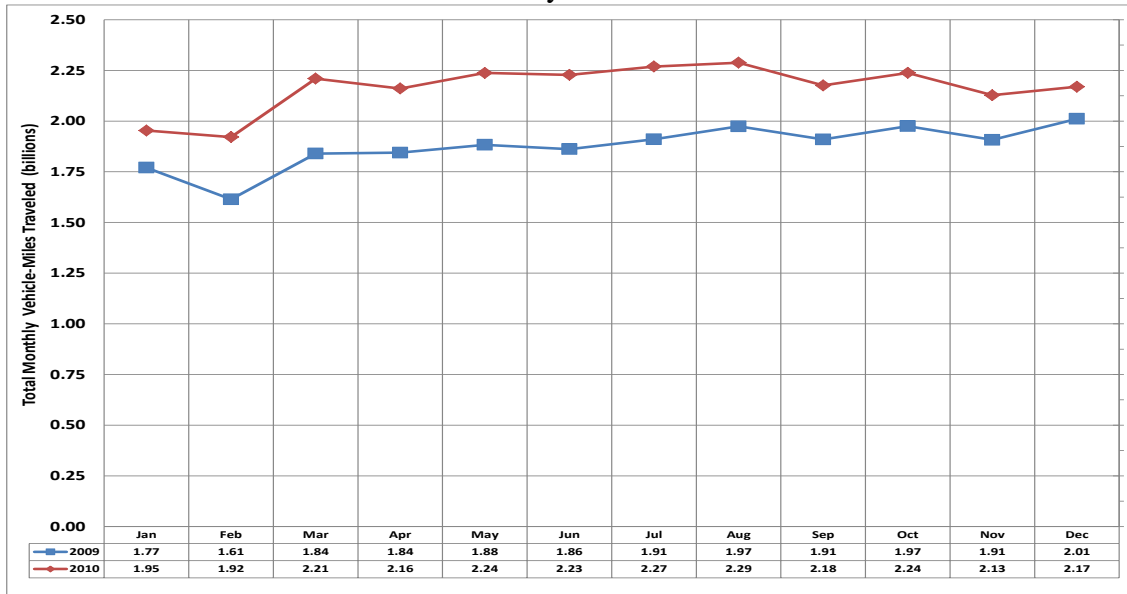
Bay Area Congestion by County

DISTRICT 4 ANNUAL VEHICLE HOURS OF DELAY BY COUNTY				
County	2009 AVHD (35 mph)	Percent of District Total (35 mph)	2009 AVHD (60 mph)	Percent of District Total (60 mph)
Alameda	5,550,000	32.8	13,230,000	33.0
Contra Costa	2,257,000	13.3	5,284,000	13.2
Marin	440,000	2.6	1,239,000	3.1
Napa	2,000	0.0	33,000	0.1
San Francisco	2,139,000	12.6	4,509,000	11.2
San Mateo	1,851,000	10.9	3,745,000	9.3
Santa Clara	3,180,000	18.8	7,966,000	19.9
Solano	1,100,000	6.5	2,736,000	6.8
Sonoma	393,000	2.3	1,360,000	3.4
Total	16,911,000*	100.0	40,102,000	100.0
* The County figures for AVHD at 35 mph do not sum exactly to the Total because of rounding to the nearest thousand.				

# Traffic Operational Assessment

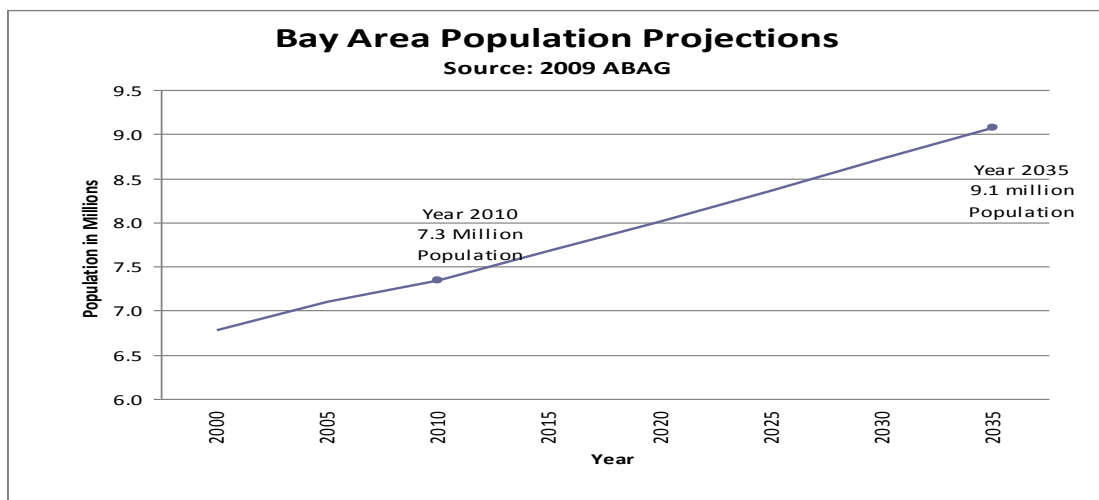
## SAN FRANCISCO BAY AREA BACKBONE EXPRESS LANES NETWORK

Total Monthly VMT 2009-2010



### Future Population Growth:

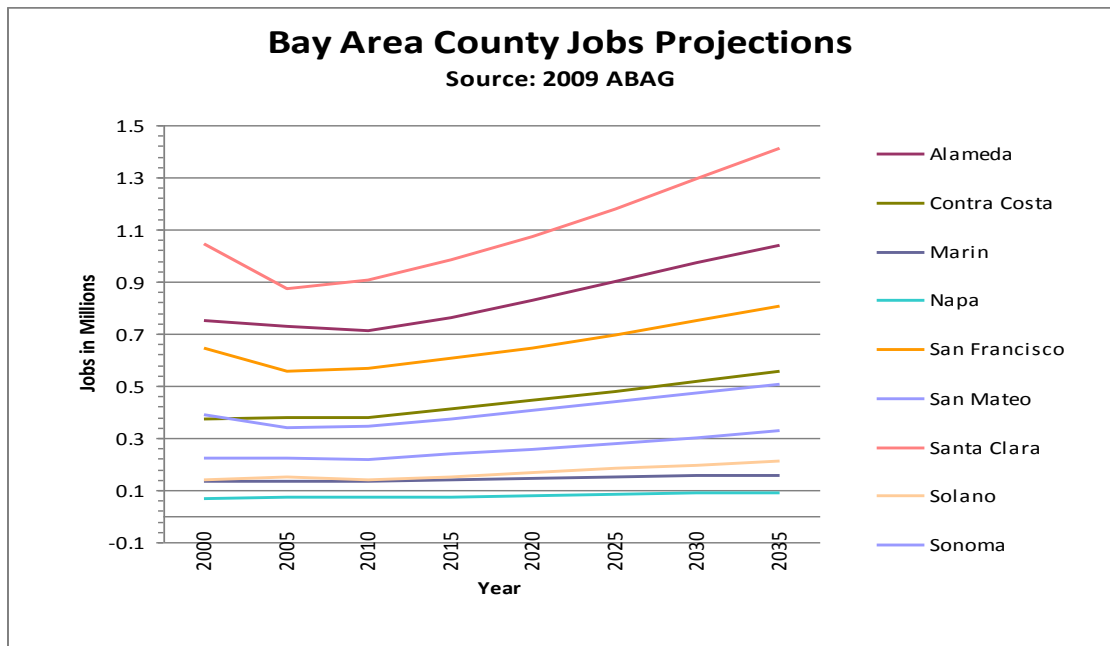
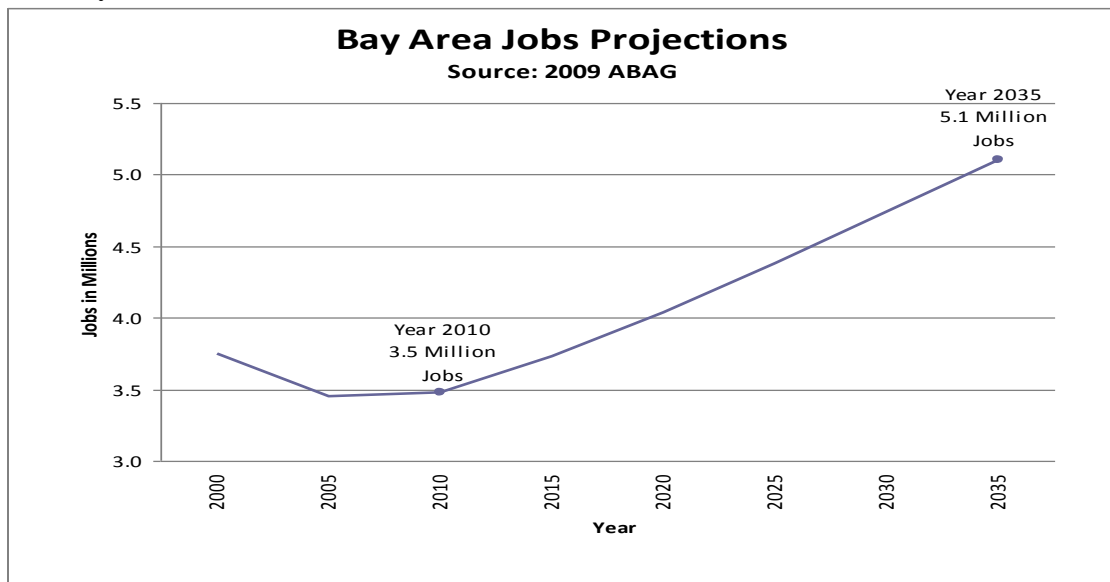
The population of California is expected to increase in the next 20 years. Based on Reason Foundation report in “Building Road to Reduce Congestion in America’s Cities”, California is expected to add another 10 million people by 2030. According to 2009 ABAG projection the Bay Area population will pass 9 million in the years 2035, an increase of 25% from about 7.3 million people in 2010.



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### Future Jobs Growth:

According to ABAG, about 3.5 million jobs were available in 2009 and that is expected to increase to 5.1 million jobs by 2035, an increase of 46%. Most of the job growth is expected to occur in the metropolitan area and while the growth rate is less than what was expected during the height of the Bay Area economy, it is still expected to increase in the future years. Below are job projections for each individual county and combined for all nine Bay Area counties.

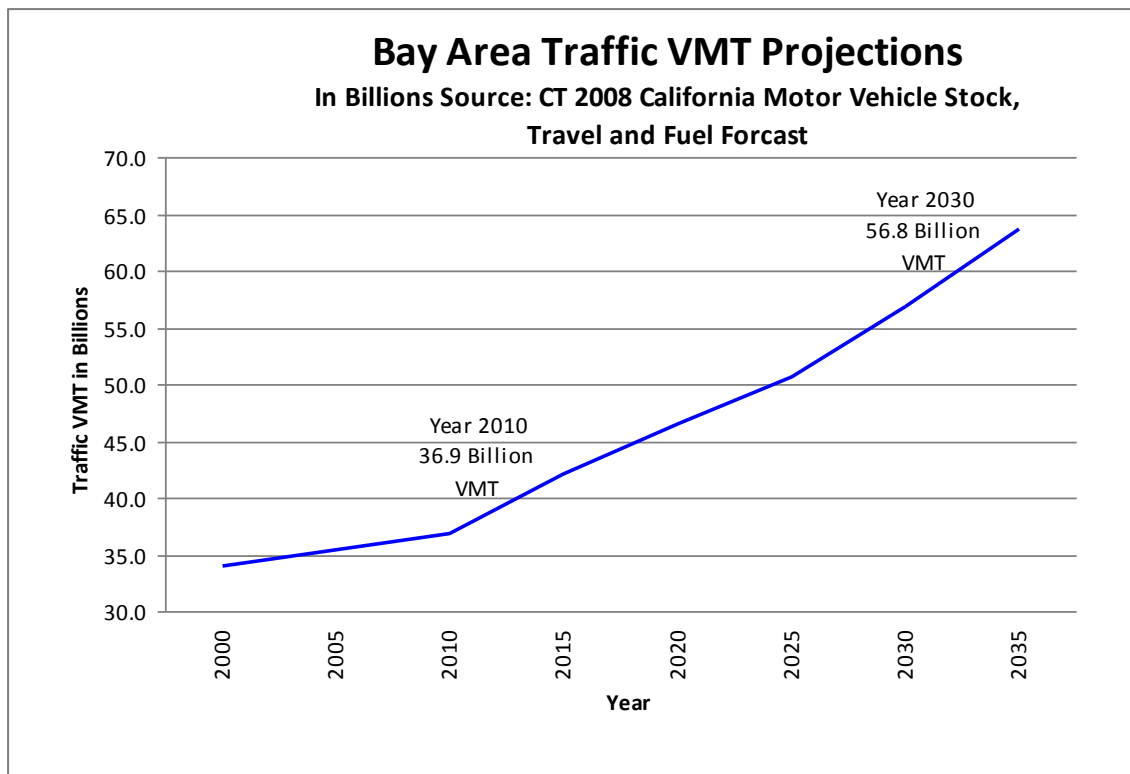


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#### Future VMT Increase:

The 2008 California Motor Vehicle Stock, Travel & Fuel Forecast (<http://www.dot.ca.gov/hq/tsip/smb/mvstaff.html>) reported by Caltrans Division of Transportation System Information, has indicated that the Bay Area VMT will continue to increase by 54% from 2010 to 2030, and to 73% by 2035.



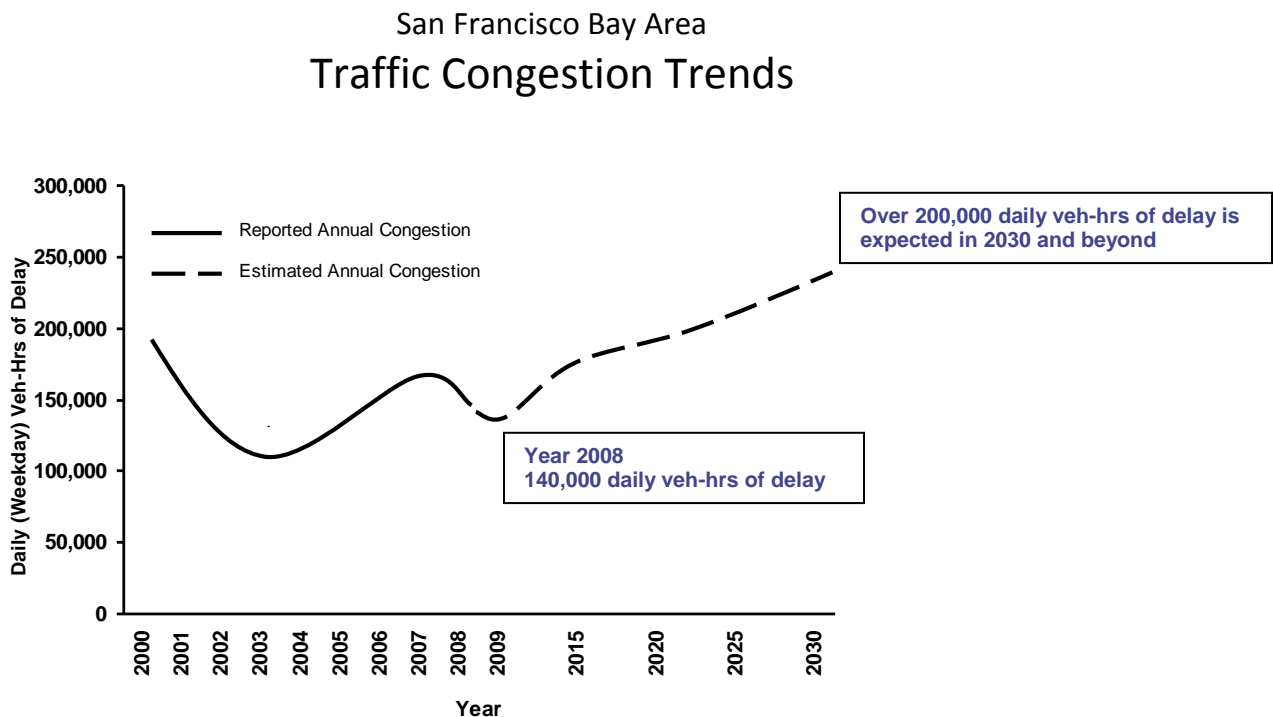
#### Future Traffic Congestion:

A more in-depth project level analysis for congestion for future years based on hourly traffic volumes for mainline corridors and for all ramps using Micro-Simulation models and more precise geometric plan will be completed as part of the individual project approval process. Study in that magnitude for all corridors in the backbone network will require significant amount of time and resources that cannot be completed at this time. However we can say for certain that as population, VMT, and jobs continuous to grow future congestion level will increase as well. According to Reason Foundation report in “Building Road to Reduce Congestion in America’s Cities” currently San Francisco-Oakland Bay Area has the nation’s third worst traffic congestion and it will experience

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even more severe congestion in the future. According to that report San Francisco-Oakland currently has a Travel Time Index (TTI) of 1.54. This means that driving times during peak traffic hours are 54 percent longer than during off-peak times. In 2030, the travel time index is expected to be 1.86 meaning drivers will experience travel delays far worse than even present-day Los Angeles (1.75).

Using the available congestion data recorded from PeMS and other data, it is estimated that the current Bay Area congestion will increase by a minimum of about 50% in the next 20 to 25 years.



As seen by the above information, summarizing the existing and future congestion trends, population and employment growth, leading to increased vehicle miles of travel, there is a compelling case for ensuring full optimization of the transportation system. The proposed backbone Express Network can undoubtedly be expected to fulfill a proportionate role in enhancing the efficiency and full utilization of the capacity on the Bay Area freeway system.

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### III. TRAFFIC OPERATIONS EFFECTS OF EXPRESS LANES

Several approaches can be employed to better manage the existing transportation system to its optimum potential. Maximizing capacity, increasing person throughput, reducing traffic demand, or shifting demand to less congested periods are options to better manage our existing transportation system. Many of these strategies are included in the various Bay Area Corridor System Management Plans (CSMPs) and are being pursued in cooperation with MTC, through the Freeway Performance Initiative. The Express Lanes Network operations serve as a complementary and an effective tool for real-time multimodal system management operations, adding additional capacity, connectivity, travel time, reliability, transit, and system performance benefits. Of these, the added capacity afforded through full utilization of the unused available capacity in the HOV network and the enhance connectivity via extending and closing existing gaps in the HOV network are expected to have the most prominent effects.

#### 1. Connectivity Benefits:

Continuity and connectivity to and from major employment centers are essential in the effectiveness of HOV lanes in encouraging ridesharing and transit as well as delivery of meaningful travel time savings. Unless gaps are closed and logical extensions are made in the HOV lane network, certain available capacity in the HOV lanes will remain unused, and full system efficiency will not be achieved. The time savings and trip reliability benefits provided by closing specific gaps in the HOV lane network can vary from location to location. A recently completed HOV gap closure on US-101 in Marin County provides an example of the level of congestion relief that can be accomplished:

##### *Southbound, morning commute:*

- *Maximum delay in general purpose lanes reduced by 72% from 29 to 8 minutes*
- *Maximum delay in HOV lane reduced by 77% from 22 to 5 minutes*
- *Congestion period reduced by 56% from 4.5 to 2 hours.*

##### *Northbound, afternoon commute:*

- *Maximum delay in general purpose lanes reduced by 50% from 12 to 6 minutes*
- *Maximum delay in HOV lanes reduced by 73% from 5.5 to 1.5 minutes*
- *Congested period reduced by 38% from 4 to 2.5 hours.*

With many gaps still in the HOV lane network, transit and HOV lane users will not fully experience reliable trips free of congestion in many freeway segments. Unfortunately, right-of-way challenges and the associated high costs preclude closing of the existing gaps in the HOV lanes network at this time and instead operational strategies will be implemented to enhance the mobility on these segments. Such gaps, for example, include



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a 19.9-miles segment on both directions of I-880, between the I-80/580/880 distribution structure and Hegenberger Road, in Alameda County.

Notwithstanding, as currently perceived, the proposed Express lanes network would promote connectivity by including new facilities, HOV lane extensions and gap closures on the Bay Area HOV Lane network. New and extensions projects included in the network are:

- a) Eastbound and westbound I-80 between Airbase Parkway and I-505 in Solano County
- b) Northbound I-680 between SR-237 and SR-84 in Alameda and Santa Clara Counties
- c) Northbound I-680 between North Main Street and SR-242 in Contra Costa County
- d) Westbound I-580 between San Ramon Valley Road/Foothill Boulevard and Greenville Road
- e) Eastbound and westbound I-580 between Greenville Road and the San Joaquin County line in Alameda County
- f) Northbound I-880 between Lewelling Boulevard and Hegenberger Road in Alameda County
- g) Southbound I-880 between Hegenberger Road and Marina Boulevard in Alameda County

The network would also include system expansion to close the gap in the current HOV lane. These gap closure projects include:

- a) Eastbound and westbound I-80 between Red Top Road and the Carquinez Bridge in Solano County
- b) Northbound and Southbound I-680 between the Benicia-Martinez Bridge and I-80, including direct connectors between I-80 and I-680 in Solano County
- c) I-680 between North Main Street and Livorna Road in Contra Costa County
- d) I-680 between Alcosta Boulevard and SR-84, including direct connectors between I-580 and I-680 in Alameda County

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The anticipated gap closures and the system extensions that promote connectivity within and to/from the Bay Area are expected to have significant operational benefits in travel delays for carpools and transit, as well as an overall reduction in duration of the congestion.

### 2. Capacity Benefits:

Utilization of the unused available capacity in the HOV lanes helps optimize the freeway network's overall capacity. With careful conversion of the HOV lanes to Express lanes, when there is available capacity, vehicle-throughput can be increased and mainline congestion can be reduced for all users. The conversion will provide choice for solo vehicles to access the Express lanes. The reduction in the mainline congestion will vary based upon the available capacity in the peak hour and other hours of the peak periods.

Constructing additional Express lanes particularly on corridors with high traffic demand will increase capacity and person throughput but it cannot be implemented on many corridors due to environmental and right-of-way constraints as well as prohibitive capital costs. Encouraging modal and temporal shifts to other hours of the peak period when capacity is available can increase the overall person throughput with careful pricing.

In order to help quantify the potential benefits of the proposed Express Lanes Network, available capacity in each of the proposed corridors was evaluated based on the respective current minimum HOV occupancy requirement, existing traffic volumes and future traffic projections. A preliminary evaluation was made for all Bay Area corridors using existing data from Caltrans HOV lane monitoring report and future peak hour HOV forecast provided by the Metropolitan Transportation Commission (Attachment 2) and approved by Caltrans. Please note that HOV forecast is based on current occupancy requirement. The tables, on the pages following, summarize the estimated increase in total capacity (or throughput) during peak hour for current and future years. As seen by the tables, with the current occupancy requirements remaining unchanged, there are certain corridors where there would be no expected available unused capacity. However, some corridors will have available (unused) capacity that may be utilized for tolling in the interest of system optimization, particularly during the near-term. For the longer term, additional available unused capacity may be available in some corridors such as Santa Clara Route 85 or on Interstate 580 in Alameda County, where adding a second Express lane is possible.

While the expected capacity enhancements vary widely from corridor to corridor, the overall benefit of the conversion from HOV to Express Lanes operation is considered significant.

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**Estimated Increase in Total Capacity  
For  
Routes Requesting Express Lane Authority (peak hour)**

County/Dir/Rte/Peak	One Express Lane			Two Express Lanes	
	2010	2020	2035	2020	2035
ALA/CC EB I-80 (AM peak), 3+	18%	18%	18%	N/A	N/A
ALA/CC EB I-80 (PM peak), 3+	4%	4%	3%	N/A	N/A
ALA/CC WB I-80 (AM Peak), 3+	0%	0%	0%	N/A	N/A
ALA/CC WB I-80 (PM Peak), 3+	14%	11%	10%	N/A	N/A
SOL EB I-80 (AM Peak), *2+	16%	16%	15%	N/A	N/A
SOL EB I-80 (PM Peak), *2+	11%	9%	6%	N/A	N/A
SOL WB I-80 (AM Peak), *2+	14%	6%	5%	N/A	N/A
SOL WB I-80 (PM Peak), *2+	15%	9%	8%	N/A	N/A
ALA/SCL SB I-880 (AM Peak), 2+	0%	0%	^0%	N/A	N/A
ALA/SCL SB I-880 (PM Peak), 2+	8%	7%	5%	N/A	N/A
ALA/SCL NB I-880 (AM Peak), 2+	3%	3%	^0%	N/A	N/A
ALA/SCL NB I-880 (PM Peak), 2+	3%	3%	^0%	N/A	N/A
CC/SOL NB I-680 (AM Peak), 2+	10%	5%	^0%	N/A	N/A
CC/SOL NB I-680 (PM Peak), 2+	7%	3%	3%	N/A	N/A
CC/SOL SB I-680 (AM Peak), 2+	2%	0%	^0%	N/A	N/A
CC/SOL SB I-680 (PM Peak), 2+	15%	3%	^0%	N/A	N/A

### Notes

Reflects current HOV occupancy requirement, unless otherwise noted.

- ^ Improved mobility can be expected with a 3+ occupancy requirement for 3 hours each during the a.m./p.m. peaks and careful pricing to attract adequate solo users. Minimum occupancy requirement can revert back to 2+ at all other times.
- 2+ occupancy requirement in Solano County must be increased to 3+ to match the occupancy in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor to provide a seamless connected HOV lane.

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### Estimated Increase in Total Capacity

#### For

#### Routes with Existing Express Lane Legislative Authority (peak hour)

County/Dir/Rte/Peak	One Express Lane			Two Express Lanes	
	2010	2020	2035	2020	2035
ALA NB I-680 (AM Peak), 2+	N/A	8%	2%	N/A	N/A
ALA NB I-680 (PM Peak), 2+	N/A	7%	^0%	N/A	N/A
ALA SB I-680 (AM Peak), 2+	EL	EL	EL	N/A	N/A
ALA SB I-680 (PM Peak), 2+	EL	EL	EL	N/A	N/A
ALA EB I-580 (AM Peak), 2+	18%	18%	11%	38%	31%
ALA EB I-580 (PM Peak), 2+	10%	∞10%	0%	∞30%	∞20%
ALA WB I-580 (AM Peak), 2+	N/A	∞10%	0%	∞30%	∞20%
ALA WB I-580 (PM Peak), 2+	N/A	18%	6%	38%	26%
SCL/SM NB US 101 (AM Peak), 2+	0%	0%	0%	25%	20%
SCL/SM NB US 101 (PM Peak), 2+	13%	10%	7%	37%	33%
SCL/SM SB US 101 (AM Peak), 2+	10%	7%	2%	33%	28%
SCL/SM SB US 101 (PM Peak), 2+	0%	0%	0%	22%	18%
SCL NB SR 85 (AM Peak), 2+	0%	0%	0%	40%	38%
SCL NB SR 85 (PM Peak), 2+	33%	33%	25%	73%	65%
SCL SB SR 85 (AM Peak), 2+	35%	33%	33%	73%	73%
SCL SB SR 85 (PM Peak), 2+	0%	0%	0%	35%	33%

#### Notes

Reflects current HOV occupancy requirement, unless otherwise noted.

- ∞ Available capacity will be less, if higher forecast HOV volumes by Alameda County (2006) are used.
- ^ Improved mobility can be expected with a 3+ occupancy requirement for 3 hours each during the a.m./p.m. peaks and careful pricing to attract adequate solo users. Minimum occupancy requirement can revert back to 2+ at all other times.
- \* 2+ occupancy requirement in Solano County must be increased to 3+ to match the occupancy in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor to provide a seamless connected HOV lane.

A discussion of the expected capacity enhancement afforded by the proposed conversion of HOV to Express Lanes for each corridor is provided below:

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INTERSTATE 80, from the Bay Bridge Toll Plaza in Alameda County to the Solano/Yolo County Line.

**Alameda and Contra Costa Counties:** The current HOV lane minimum occupancy requirement in both directions is 3+, hours of operations are: 5 – 10 a.m., 3 – 7 p.m., Monday through Friday.

- Eastbound: The peak direction of travel for eastbound direction occurs in the evening hours. Current peak hour usage in the HOV lane is just above 1300 vehicles per hour (vph). Because of physical constraints at the San Francisco Oakland Bay Bridge (SFOBB) and the distribution structure at I-80/I-580/I-880 interchange, future HOV volumes are not expected to increase significantly from current levels. Therefore some capacity will be available for express vehicles during the peak commute hours. With a conversion to an Express lane, existing mainline capacity can be increased by approximately 4% and future capacity in 2020 by approximately 4% and in 2035 by 3%. Minor improvement in congestion for general purpose lanes without degradation of HOV lane in the peak hour can be expected with conversion to an Express lane. In the shoulder of the peak additional capacity in the HOV lane is available although no major time savings is expected. An increase of capacity of about 8% in the shoulder of the peak can also be expected based on existing HOV lane volumes. Additional weekend capacity is also available however careful pricing will be needed to make sure adequate number of vehicles utilizing the Express lane to prevent creating congestion due to loss of unrestricted capacity.

The eastbound morning peak will have capacity available but no congestion is expected to occur as this is/will be the off-peak direction, therefore no significant time saving from recurrent congestion will be realized. The conversion to Express lane will increase the capacity by 18%. With Express lane, the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

- Westbound: The westbound peak commute direction on I-80 is in the morning. Due to high time saving benefits experienced by HOV users, the current HOV lane in the peak hour is at capacity and some slow down and congestion in the HOV lane occurs daily. As a result, there is no capacity available for a conversion to an Express lane in the westbound morning peak hours within this segment of the corridor. In addition, with 3+ occupancy currently required in the HOV lane it would be impractical and unlikely that an increase in occupancy to 4+ would occur any time soon to provide additional capacity for an Express lane.

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The HOV lane usage in the westbound evening peak is about 500 vph and is expected to increase to 800 vph in 2035. Capacity will be available for an Express lane conversion which could improve congestion in the general purpose lanes that currently exist between University Avenue and the I-580/I-880 junction. With conversion to an Express lane the existing capacity can be increased by approximately 14% and the available capacity in 2020 by approximately 11% and by 10% in 2035.

**Solano County:** The current HOV lane minimum occupancy requirement in both directions is 2+, hours of operations are: 5 – 10 a.m., 3 – 7 p.m., Monday through Friday.

- **Eastbound:** It is expected that capacity for I-80 corridor will also be available for Solano County as well. Unlike Alameda and Contra Costa Counties where the peak hour HOV lanes are either at or near capacity, the Solano County HOV lane has available capacity. Currently some evening congestion occurs on eastbound I-80 at around I-680 interchange. No degradation of HOV lane is expected as the current HOV lane usage is about 700 vph in the evening peak and that volumes are expected to grow to about 1100 vph in 2035. With a conversion to an Express lane the existing capacity can be increased by approximately 11% and available capacity in 2020 by approximately 9% and capacity increase in 2035 by 6%. In the shoulder of the peak and on weekends additional capacity in the HOV lane is also available although no major time savings is expected during typical traffic condition. During major incidents time savings can be noticeable and with proper pricing usage of the lane can be increased with conversion to an Express lane.

The eastbound morning peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. Conversion to Express lane will increase the morning peak capacity by 15% to 16%. With Express lane the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

- **Westbound:** The westbound peak commute direction is in the morning and the current HOV usage is about 500 vph. The peak hour HOV usage by 2035 is expected to double the current volumes. There is existing congestion near I-780, which Express lane users can bypass. With a conversion to an Express lane existing capacity can be increased by approximately 14% and available capacity in 2020 by approximately 6% and capacity increase in 2035 by 5%.

The westbound evening peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. The conversion to Express

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lane will increase the existing capacity by 15% and future capacity from 8% to 9%.

The minimum occupancy requirement of 2+ in Solano County would have to be increased to 3+ to match the occupancy rate in Contra Costa and Alameda Counties prior to the completion of the last HOV lane segments of this corridor that will provide a seamless connected HOV lane. Additional capacity in the Express lane in the Solano County will be available with conversion to 3+ and with careful pricing the utilization of Express lane can be increased to prevent unnecessary slow down in the general purpose lanes.

INTERSTATE 880, from Route 85 in Santa Clara County to Hegenberger Road in Alameda County. This is the main corridor for trucks to access port of Oakland and truck percentage in this corridor is from 9% to 11% of total traffic.

**Alameda and Santa Clara Counties:** The current HOV lane minimum occupancy requirement in both directions is 2+, hours of operations are: 5 – 9 a.m., 3 – 7 p.m. Monday through Friday.

- **Southbound:** There is no defined peak direction in this corridor. Current HOV lane usage in the morning peak is about 1300 vph south of Hesperian and is expected to increase to about 1500 vph by 2035 in the morning peak hour. Congestion in the morning peak hour occurs between SR 238 and SR 92 for approximately 3 hours in the general purpose lanes. Theoretically the HOV lane has some available capacity in the current year but the lane slows down near SR 92 and therefore is most likely near capacity already. Because of that the conversion to Express lane would provide a minimal improvement to the future congestion in the general purpose lanes on southbound I-880 approaching SR 92 interchange. It is expected however that some capacity would still be available to improve trip reliability at other portions of this corridor.

The existing HOV usage in the evening peak hour is slightly less than the peak hour usage in the morning. Currently, about 1100 vph utilized HOV lane in the peak hour. Congestion occurs between SR 238 and Industrial Boulevard in the general purpose lanes on a daily basis. HOV usage is expected to increase to about 1300 vph by 2035 near Whipple Road and near Coleman Avenue therefore there is available capacity in the HOV lane in the evening peak hour. With a conversion of HOV lane to an Express lane, existing general purpose lanes capacity can be increased by approximately 8%, by about 7% in 2020 and by about 5% in 2035.



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- Northbound: Current HOV lane usage is about 1400 vph north of Whipple Road and is expected to increase to about 1600 vph by 2035 in the morning peak hour. Existing congestion occurs between Whipple Road to SR 92 for about 2 hours on a daily basis in the general purpose lanes. There is a small amount of capacity available in the HOV lane and with a conversion to an Express lane existing and 2020 capacity can be increased by approximately 3%. However, by 2035 there would be no capacity available in the HOV lane.

Current HOV lane usage is about 1400 vph north of Whipple Road and is expected to increase to about 1600 vph by 2035 in the evening peak hour. Existing congestion occurs between Decoto Road to SR 92 for about 3 hours, also between SR 262 Mission and Automall Parkway for about 1 hour. There is a small amount of capacity available in the HOV lane and with a conversion to an EL existing capacity can be increased by approximately 3% and by about 3% in 2020. However, by 2035 there would be no capacity available in the HOV lane.

With EL the travel time savings for the off-peak hours and weekend from non-recurrent congestion due to incidents can be significant.

INTERSTATE 680, from the Alameda/Contra Costa County Line to I-80 in Solano County.

**Contra Costa and Solano Counties** - the current HOV lane minimum occupancy requirement is 2+, hours of operation 5 – 9 a.m., 3 – 7 p.m., Monday through Friday on mainline, and 3+ during 5 – 10 a.m. and 3 – 7 p.m., Monday through Friday, at the Benicia/Martinez Bridge toll plaza.

- Northbound: The northbound peak in the morning hours occurs between Alcosta Boulevard and Livorna Road with an HOV lane usage of about 1000 vph. The HOV lane usage is expected to increase to 1700 vph by 2035. In the interim years there would be available capacity for a conversion to an Express lane. With a conversion to an Express lane the current capacity can be increased by approximately 10% and by about 5% in 2020. This will relieve some congestion in the general purpose lanes until the HOV lane usage reaches capacity prior to 2035.

In the evening, the highest HOV usage will be between State Route 242 and Marina Vista interchange at about 1200 vph. The HOV lane usage is expected to increase to 1400 vph by 2035. There would be available capacity for a conversion to an EL that would also provide congestion improvement in the general purpose lanes. With a conversion to an Express lane existing capacity can be increased by

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approximately 7% and future capacity by approximately 3% in 2020 and also in 2035.

- **Southbound:** In morning, the southbound peak direction of travel in this corridor is between the Marina Vista and North Main Street with an HOV lane usage of about 1400 vph. The HOV lane usage is expected to reach its capacity with projected volumes of about 1800 vph by 2035 or sooner. There is a small amount of capacity available in the HOV lane initially and with a conversion to an Express lane existing capacity can be increased by approximately 2%. However, by 2020 there would be no capacity available in the HOV lane.

In the evening the HOV lane usage is about 700 vph, between Livorna Road and Alcosta Boulevard. The future HOV lane usage is expected to increase to 1700 vph by 2035. There is available capacity currently in the HOV lane and with a conversion to an Express lane existing capacity can be increased by approximately 15% and by 3% in 2020. However, by 2035 there would be no capacity available in the HOV lane.

**Alameda County** - The current HOV lane minimum occupancy requirement is 2+, and the hours of operation is 5 – 9 a.m., 3 – 7 p.m., Monday through Friday.

- **Northbound:** Currently significant delays occur in the evening peak as demand traffic exceeds the available capacity. There is no existing HOV lane in the northbound direction however the addition of HOV lane is expected to improve congestion from the day of opening. The usage of HOV lane during the evening peak period is expected to be similar to the morning peak in the southbound direction (600-800 vph) initially but that will increase to about 1200 vph in 2020 and about 1600 vph in 2035. In 2020, there would be about 7% available capacity in the HOV lane for an Express lane conversion. However, by 2035 there will be no available capacity.

The northbound morning peak will have capacity available but no recurrent congestion is expected to occur as this is and will be the off-peak direction and therefore no significant time saving will be realized. The conversion to Express lane however will increase the capacity by 8% in 2020 and by 2% in 2035.

- **Southbound:** There is an EL from Route 84 in Alameda County to SR 237 in Santa Clara County in operation. The current usage of the Express lane is about 1100 vph in the morning peak with about one half HOV's and the other half solo vehicles. Travel times savings varies from day to day but on an average the Express lane provides about 3 minutes of time savings daily. The section north of

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Route 84 is congested so an addition of Express lane in that area can add to the travel time savings for Express lane users.

There is no recurrent congestion in the evening peak hours in the southbound direction in Alameda County as that is the off peak direction. No recurrent congestion occurs on weekend.

INTERSTATE 580 corridor from I-680 to I-205 in Alameda County, a distance of 21 miles. This corridor is currently authorized for Express Lane operations. Main commute route between the affordable residential communities in San Joaquin Valley and employment centers at tri valley and Silicon Valley. The only HOV lane on this corridor is currently in eastbound direction with minimum occupancy requirement of 2+; hours of operation are 5 – 9 a.m., 3 – 7 p.m., Monday through Friday.

- **Eastbound:** In evening, the eastbound direction is the peak direction with an HOV lane usage of about 800 vph. The opening of HOV lanes completed recently has significantly reduced the recurrent congestion in the peak commute hours. Congestion however is expected to increase in the future. The HOV lane is expected to increase to about 1700 vph in 2035. There is available capacity for an EL conversion in the interim which would improve congestion in the GP lanes prior to 2035. With a conversion to an Express lane existing capacity can be increased by approximately 10% and capacity in 2020 by 10%. However, by 2035 there would be no capacity available in the HOV lane. A study by the Alameda County Transportation Commission in 2006 concluded that the capacity of the single HOV lane will be reached prior to 2020 and as a result a second HOV lane between Tassajara Road and Vasco Road is being designed to be constructed in time for conversion to Express lane. With the added second Express lane the available capacity will be increased by about 20%.

There is no recurrent congestion in the morning peak hours and the current HOV usage is about 200 vph. The utilization of HOV's is expected to remain at 200 vph and to increase to about 700 vph by 2035. The increase in capacity by conversion to Express lane will be 18%, 18% in 2020, and 11% in 2035.

- **Westbound:** In the morning, the peak commute direction is in the westbound direction as San Joaquin residents headed to employment centers in the east and south bay that results in significant daily congestion. Currently there is no HOV lane in the westbound direction, however there is a planned HOV lane with an expected HOV lane usage of 800 vph in 2020 and 1800 vph in 2035. There is available capacity for an Express lane conversion in the interim, about 10% in 2020, which would improve the overall congestion prior to 2035 but similar to the

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eastbound direction the single lane capacity can be reached by 2020. With the added second Express lane the capacity will be increased by about 20%.

There is no recurrent congestion in the evening hours except at the approach to the I-680 interchange. The HOV usage in 2020 is expected to be at about 200 vph and in 2035 at about 1100 vph and the increase in capacity will be 18% in 2020 and 6% in 2035.

US-101 corridor from Cochrane Road in Santa Clara County to Whipple Avenue in San Mateo County a distance of nearly 42 miles in each direction. The Santa Clara County portion of this corridor is currently authorized for Express lane operations and a new legislation extended authorization into San Mateo County. Authorization also exists for the segment between Cochrane Road and the San Benito County Line.

Santa Clara and San Mateo County: The minimum occupancy requirement for HOV lane is 2+ and the mainline hours of operations are 5 - 9 a.m., 3 - 7 p.m., –Monday through Friday.

- **Northbound:** The peak direction of travel is in the morning peak and the HOV lane is currently at capacity with about 1600 vph around downtown San Jose. Congestion in the HOV lane occurs at around Mckee Road and between North First Street and Trimble Road. Traffic demand for HOV lane is expected to increase to about 2000 vph in 2035. Because of high demand for the HOV lane already, for a conversion to an EL an additional lane would need to be constructed to provide a two lane EL facility with the needed capacity. With a two lane Express lane, the mainline capacity will be increased by 27% immediately, by 25% in 2020 and by 20% in 2035.

In the evening, the northbound HOV lane usage is about 800 vph north of SR 85 interchange in Mountain View. The HOV lane usage is expected to increase to about 1200 vph in 2035. There is currently capacity available in the HOV lane. With an Express lane conversion existing capacity can be increased by about 13% and available capacity in 2020 by approximately 10% and by approximately 7% in 2035. However, about 37% more capacity will be added in 2020 when the second Express lane is provided and 33% in 2035.

- **Southbound:** In the evening, the southbound direction is the peak commute direction. Similar to the northbound direction, the southbound HOV lane is currently at capacity with about 1650 vph in the evening peak with HOV congestion approaching the downtown area. Daily congestion and slow-downs in the general purpose lanes occur between Lawrence Expressway and Tully Road. Before conversion to an Express lane, an additional lane would need to be

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constructed to provide the needed capacity with a two lane Express lane facility. The expected HOV demand by 2035 is forecast to be at about 2100 vph. With the second Express lane, the overall capacity of the corridor is expected to increase by about 22% in 2020 and 18% in 2035.

In the morning, the southbound HOV lane usage is currently at about 1000 vph. This usage is expected to increase to about 1500 vph in 2035. There is currently capacity available in the HOV lane. With an Express lane conversion existing capacity can be increased by about 10% and available capacity in 2020 by 7% and by approximately 2% in 2035. However, in 2020 about 33% and in 2035 about 28% more capacity will be added when the second Express lane is provided.

State Route 85 corridor in Santa Clara County from southern US-101 interchange in south San Jose to northern US-101 interchange in Mountain View a distance of about 24 miles. This corridor currently has legislative authorization for Express lane operations. HOV lane minimum occupancy requirement, 2+, hours of operations 5 - 9 a.m., 3 - 7 p.m., –Monday through Friday on mainline.

- **Northbound:** In the morning, the northbound direction is the peak direction. The HOV lane is currently at capacity and mainline congestion between Santa Teresa Boulevard and Saratoga Avenue. The volumes in the HOV lanes are recorded to be at about 1200 vph but because of some slow down in the lane from SR 87 to north of Winchester Boulevard demand traffic are higher than what is recorded. The HOV lane usage is expected to increase by about 100 vph in 2035. To alleviate the current and future slow-downs in the HOV lanes an additional lane between Route 87 and I-280 where HOV demand is high will increase the available capacity by about 40% in 2020 and by 38% in 2035, when it is converted to Express lane.

The evening peak will have capacity available but no recurrent congestion is expected to occur as this is/will be the off-peak direction and therefore no significant time saving will be realized except during incidents. The conversion to Express lane will increase the capacity by 33% and 25%. The capacity will increase significantly with the second Express lane.

- **Southbound:** The peak commute direction occurs in the evening hours with about 1200 vph HOV lane usage. Similar to the northbound direction, the HOV lane slows down between I-280 and Camden Avenue, which indicates that demand traffic is higher than the volumes recorded. As such capacity is not available. The HOV lane usage is expected to increase by an additional 300 vph in 2035. For a conversion to an Express lane an additional lane would need to be constructed

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between I-280 and Route 87 to provide a two lane Express lane facility. That will increase the current available capacity by about 35% in 2020 and 33% in 2035.

The morning peak will have capacity available but no recurrent congestion is expected to occur as this is/will be the off-peak direction and therefore no significant time saving will be realized except during incidents. The current capacity with the conversion to Express lane will be about 35%, 33% in future years and significantly higher with the second Express lane.

# Traffic Operational Assessment

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### **Estimated traffic conditions with 3+ minimum occupancy requirement:**

Table below summarizes the expected added freeway capacity with conversion to three-or-more persons per vehicle in 2020, based on 3+ forecast data, for corridors currently operating with 2+ minimum carpool occupancy requirement (see attachment 3).

#### **Estimated Increase in Total Capacity For Routes Requesting Express Lane Authority with 3+ occupancy requirement (peak hour)**

County/Dir/Rte/Peak	One Express Lane		
	2010	2020	2035
ALA/CC EB I-80 (AM peak), 3+	-	No Change	No Change
ALA/CC EB I-80 (PM peak), 3+	-	No Change	No Change
ALA/CC WB I-80 (AM Peak), 3+	-	No Change	No Change
ALA/CC WB I-80 (PM Peak), 3+	-	No Change	No Change
SOL EB I-80 (AM Peak), 3+	-	NR	NR
SOL EB I-80 (PM Peak), 3+	-	NR	NR
SOL WB I-80 (AM Peak), 3+	-	NR	NR
SOL WB I-80 (PM Peak), 3+	-	NR	NR
ALA SB I-880 (AM Peak), 3+	-	2-3%	1-5%
ALA SB I-880 (PM Peak), 3+	-	1-2%	2-3%
ALA NB I-880 (AM Peak), 3+	-	2-3%	1-3%
ALA NB I-880 (PM Peak), 3+	-	2-7%	2-5%
CC ** NB I-680 (AM Peak), 3+	-	3-6%	1-5%
CC ** NB I-680 (PM Peak), 3+	-	2-8%	3-7%
CC ** SB I-680 (AM Peak), 3+	-	2-6%	3-6%
CC ** SB I-680 (PM Peak), 3+	-	3-8%	2-8%
SOL ** NB I-680 (AM Peak), 3+	-	NR	NR
SOL ** NB I-680 (PM Peak), 3+	-	NR	NR
SOL ** SB I-680 (AM Peak), 3+	-	NR	NR
SOL ** SB I-680 (PM Peak), 3+	-	NR	NR

#### **Notes**

NR: Not recommended until all HOV/EL gaps in the entire corridor are completed and connected to CC portion, or unless future traffic volumes for HOV/EL will be higher than is forecasted.

\*\* The estimated capacity increase shown are for segments of I-680 in CC County south of the SR 24 interchange. A 3+ conversion north of SR 24 interchange in Contra Costa County and in the entire Solano County on either direction and in both future years is not recommended unless all gaps in the HOV/EL are completed, or unless future traffic forecast for HOV/EL will actually be higher than what is forecasted today.



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This evaluation is for all three corridors that are in the authorization request:

I-80 in Solano County: An increase in the minimum occupancy requirement to 3+ in the year 2020 is not expected to attract many users in the HOV/Express Lanes in Solano County and as a result it will increase traffic volumes in the general purpose lanes. However the added traffic volumes are not expected to cause congestion in the general purpose lanes but a 3+ requirement will cause HOV/Express lanes to be underutilized with low volumes, which can generate negative public reaction. As such increasing the occupancy requirement to 3+ in Solano County segment could be delayed until the last segment of gap closure project is completed, unless future traffic volumes for HOV/Express Lanes will actually be higher than is forecasted. Operating with the same occupancy requirement in the corridor without any gaps will ensure the continuity in the HOV/EL throughout this corridor.

I-680 in Alameda & Contra Costa Counties: An increase in the minimum occupancy requirement for I-680 HOV/EL to 3+ is expected to improve mobility for the segments south of the SR 24 interchange in both directions by the year 2020. But conversion to 3+ for segments north of SR 24 interchange could be delayed and evaluated later for years beyond 2020, unless future traffic volumes for HOV/EL will actually be higher than is forecasted. Conversion to 3+ for the segment north of the SR 24 interchange in 2020 in both directions will increase traffic volumes in the general purpose lanes however that is not expected to cause congestion in the GP lanes.

There is a gap closure project currently in preliminary evaluation phase for the southbound direction to connect the HOV lane north of the SR 24 interchange to the south of the interchange. If that project is completed by the year 2020 then the increase in minimum occupancy requirement to 3+ in the southbound direction will need to be implemented to avoid motorists' confusion. There is no cost effective project currently planned in the northbound direction of I-680 to connect the HOV lanes from south of the SR 24 interchange to the north of the interchange.

I-680 in Solano County: An increase in minimum occupancy requirement to 3+ for segments in Solano County is not expected to attract enough users to the HOV/EL. That would increase traffic volumes in the GP lanes however it is not expected to cause congestion on either direction. Beside the operational need, consistency in the minimum occupancy requirement on I-80 and I-680 in Solano County may be considered as one possible factor prior to change in the occupancy requirement.

I-880 in Alameda County: Increasing the minimum occupancy requirement to 3+ for this corridor in the Alameda County is expected to improve mobility in both directions.

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SR 84 in Alameda County: Current peak hour usage of HOV lane is about 1,200 vph. It is expected that in the near future the capacity of the 2+ HOV lane will be reached. Increase in minimum occupancy requirement to 3+ will ensure time saving benefit for carpool and transit users is maintained. Conversion to Express Lane will therefore be necessary to alleviate the impact of additional traffic demand in the general purpose lanes by allowing access to the carpool lane by non-carpool lanes for fee. Prior to increasing the minimum occupancy requirement, the current legislation (AB 2132 enacted on January 1992) that mandated a two-or-more occupancy requirement must be amended.

SR 92 in Alameda County: Current peak hour usage of HOV lane is about 1,100 vph. It is expected that in the near future the capacity of the 2+ HOV lane will be reached. Increase in minimum occupancy requirement to 3+ will ensure time saving benefit for carpool and transit users is maintained. Conversion to Express Lane will therefore be necessary to alleviate the impact of additional traffic demand in the general purpose lanes by allowing access to the carpool lane by non-carpool lanes for fee. Prior to increasing the minimum occupancy requirement, the current legislation (AB 2132 enacted on January 1992) that mandated a two-or-more occupancy requirement must be amended.

#### **IV. Considerations & Criteria for Operational Effectiveness:**

In order to gain the operational benefits of the available capacity in the Bay Area HOV lanes through a conversion to tolling, certain considerations and criteria are required as follows:

- With careful conversion of HOV lanes to Express lanes, network capacity and vehicle throughput can be increased and mainline congestion can be reduced for all users. The amount of congestion reduction will depend on the surplus HOV lane capacity in the peak hour and other hours of the peak periods.
- Even on corridors where HOV lanes operate at or near capacity during the peak hour, surplus capacity is available during the shoulder hours of the peak commute periods for use by tolled vehicles.
- All pertaining Statutes of California Streets and Highway Code section 149, which mandate appropriate traffic flow guidelines for the purpose of ensuring optimal use of the Express lanes by high-occupancy vehicles without adversely affecting other traffic on the state highway system, will be met.

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- Priority for buses and carpools must be maintained. Current statutes require the HOV and Express lanes to operate at LOS C/D or better with operating speeds of 45 MPH or more. Tolls will be set dynamically based on traffic volumes and traffic conditions in both the Express lane and adjacent general purpose lanes. If the mandated level of service cannot be maintained consistently during certain periods, then the lane would be operated only as an HOV lane at those times. Thus, the proposed Express lanes must be operated such that capacity is never exceeded and operating speeds remain at or above 45 miles per hour to maintain time savings benefits.
- Maximizing use of the Express lane will require that access to the lane have as few restrictions as possible. The recently developed Caltrans Managed Lane Guidelines will be used to ensure that the most appropriate access design will be implemented.
- The access configuration for express lanes will need to be designed carefully to avoid operational impacts. The limited access configuration on the existing express lane on southbound Ala-680 has resulted in a reduction in the number of HOVs using the lane. District 4 is currently evaluating the possibility of implementing Express lanes with no access control on other corridors. The recently published Caltrans' Traffic Operation Program Policy Directive requires detailed analysis of all managed lanes in accordance with Streets and Highway Code section 149, which call for competent engineering estimates to be made on the effects of a managed lanes on safety, congestion, and highway capacity prior to constructing such lanes. Analysis will be done for 20 years after implementation to ensure future safety and mobility of freeways is preserved. See Attachment 1.

It is intended that during the project level analyses for any future Express lanes, specific access configuration(s) will be analyzed in detail to ensure all concerns and impacts are addressed.

- Some HOV lane facilities have already reached capacity in parts of some corridors. If capacity in the peak hour throughout the corridor is not available, due to significant ridesharing, and widening is not feasible, consideration may be given to raising the minimum HOV occupancy requirement either during the entire peak period or the peak hour, subject to analyses of impacts in the general purpose lanes, and upon significant stakeholder and public outreach.

Raising the minimum HOV occupancy is expected to associate significant public resistance and may increase congestion. Increasing the minimum HOV occupancy requirement from 2+ to 3+ passengers per vehicle can ensure time savings incentive for transit and qualified HOV lane users. However, absent increased transit use and formation of 3+ carpools, moving the existing (made ineligible) 2+ occupancy vehicles into the general purpose lanes can result in increased congestion. If not

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mitigated, the added congestion will negatively impact mobility and will most likely result in public dissatisfaction. The negative result will be particularly apparent in those corridors where with 2+ occupancy carpool eligibility, congestion in the HOV lanes is not significant in magnitude; occurs only for a short period; and/or occurs only at few isolated spots within a long corridor.

Accordingly, to ensure public acceptance and to avoid increased congestion, any increase in the minimum occupancy requirement for an existing HOV facility, when warranted by analyses and convincing data, would have to start with a short period of time during the hours that HOV lane is congested, and must then revert back to the lower occupancy requirement when congestion in the HOV/Express lane is not present. The hours that the change in occupancy requirement is necessary must be well publicized in advance and supported by clear signing (e.g. changeable message signs along the corridor). Prior to that change, a detail analysis and evaluation using up to date traffic volumes would have to be completed to make sure impacts to the general purpose lanes are minimized. Prior to any change, all stakeholders, including the California Highway Patrol will be consulted, and the motoring public will be notified and full aware.

Additionally, to ensure optimum operations and to avoid motorists' confusion, careful consideration must be given towards consistency and continuity of the carpool occupancy requirements and operations along the network and within long transportation corridors. Changes in carpool occupancy requirement within a corridor may only be introduced at locations where the change is readily apparent to motorists through an accompanying gap in the HOV/Express lane.

- Interstate 80 HOV lane in Alameda County is already operating at capacity during the morning commute. As a result, operating this segment of the I-80 corridor as an Express lane during the period of greatest congestion will be challenging. Raising the HOV eligibility requirement from 3+ to 4+ would free up capacity to operate as an express lane, but is not practical. A 4+ minimum HOV occupancy has not been attempted anywhere in the state or in the nation. Adding new lanes in this corridor is not feasible as there is no available right-of-way for widening. This HOV lane does, however, have surplus capacity available in the shoulder hours of the peak periods. There is also CMIA-funded project that will add ITS elements in the corridor to improve safety and the associate operational improvements. These elements will provide the infrastructure needed to enable a more flexible mode of operation of an Express lane that may be needed in this corridor. However if the express lane continues to operate at capacity in the peak commute hours even with higher tolls then the lane would be operated only as an HOV lane at those times.

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- If a significant portion of an HOV/Express lane nears or reaches capacity, in order to alleviate congestion in the Express lane and/or to avert increased congestion in the general purpose lanes, additional lanes will be considered where feasible, other alternatives may be considered:
  - a) Full-time conversion: This will reduce confusion and will help for a better trip planning, but it could add to congestion particularly at shoulder hours of the peak and in the off-peak hours. The congestion may be alleviated with pricing to entice an appropriate number of vehicles into the Express lane; thus, reducing congestion in the general purpose lanes. It should be noted that an increase in minimum HOV occupancy requirement subsequent to opening has not been tried in this region, and would be challenging politically as such an action will be considered a “take away” by motorists.
  - b) Part-time conversion: A higher HOV definition could be employed only during the height of the peak when additional capacity is needed, and revert back to the lower occupancy requirement at all other times. This approach could cause motorist confusion, without sufficient advance notice to motorists, but may be more politically acceptable as drivers in northern California are already accustomed to part time HOV operation.
  - c) Graduated tolling scheme: This will include cost savings for carpools such as free passage for 3+ carpools and/or 50% discount for 2+ carpools.

These alternatives will likely impose other requirements for carpools such as carrying transponders in their vehicles or advance registration that need to be evaluated before implementation, as needed, consistent with applicable or enabling legislation.

- Hours of operation for Express lanes must be carefully analyzed and selected to avoid creating unnecessary congestion or a poor public perception. In San Francisco Bay Area, where carpool lanes are operated part-time only, 24/7 operations help clearly distinguish the Express lanes from HOV lanes. However, tolling during the off-peak periods can be viewed as a takeaway and excessive by the motoring public, or potentially leading to an unused lane (or capacity) during certain periods. Therefore, Express lane hours of operation must be selected upon a careful evaluation while keeping in mind congestion periods, carpool/transit and solo volume patterns, potential impacts on general purpose lanes, and consistency within the corridor.
- While certain operational or characteristic variations within individual corridors are expected, certain aspects of the San Francisco Bay Area Express Network must remain uniform and consistent throughout the transportation system, including the seven state operated toll bridges and the Golden Gate Bridge, particularly as viewed

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by motorists. These include a uniform tolling system including the existing FasTrak<sup>®</sup> transponders used at toll bridges and a common customer service center.

- Express lane tolling operations will also need to be integrated with tolling and/or metering operations at the Bay Area toll bridges so that carpoolers and toll-paying solo users pay their applicable bridge tolls along with the respective and dynamically priced Express lane toll. Special care must be exercised to ensure that the dynamic pricing is set such that downstream capacity on the toll bridges' mainline sections is not exceeded by solo drivers from the Express lane.
- A change in the minimum carpool occupancy requirement from 2+ to 3+ is only considered as an strategy to enhance transit operations and to provide an incentives for ridesharing. Accordingly, such a change would be deferred to only when justified by congestion in the carpool lanes and only if adding an additional carpool (or Express) is determined infeasible. A change in the minimum occupancy could also entail a respective change in carpool operational hours, including weekends, and may include staggered eligibility (2+ or 3+) depending on time of day during the day. It is expected that a change in the minimum carpool eligibility requirements would result in increased traffic volumes in the adjacent general purpose lanes and would accompany additional congestion, at least initially while the intended increase in usage of transit and ridesharing take effect. As an augmenting strategy, tolling and Express lane operations can help reduce this impact by allowing solo drivers access to the carpool lane, not only reducing demand and congestion in the adjacent lanes but also helping attain optimum efficiency and full capacity of the system.

Such changes are expected to be applied incrementally over time and on a corridor by corridor basis upon detailed analyses of needs, and as needed to maintain the integrity of carpool operations. More specifically and by way of an example, a change to 3+ carpool occupancy within the proposed Express Lane Network and years 2020/2035 planning scenarios, is expected to increase capacity on Interstate 880 in Alameda County and the portion of Interstate 680 in Contra Costa County south of the State Route 24. Conversely, the portion of Interstate 680 in Contra Costa County north of the State Route 24 and in Solano County, a 3+ occupancy requirement is not expected to attract enough carpool and/or Express Lane users to increase the freeway capacity (although at the same time also not expected to cause congestion in the general purpose lanes). Similarly, the Express Lane on Interstate 80 in Solano County will be underutilized with 3+ minimum occupancy requirement but that also is not expected to cause congestion in the general purpose lanes. As such, conversion to 3+ carpool occupancy for segments of Interstates 80 and 680 in Solano County, and the portion of Interstate 680 north of State Route 24 in the Contra Costa County, can be delayed to completion of the existing gaps in carpool lanes within those corridors.

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#### **V. CONCLUSION**

With the criteria stated above and with careful evaluation and detail analyses at project level for each corridor, the implementation of an Express Lane Network is expected to be beneficial in reducing overall congestion on the Bay Area freeways and in improving trip reliability.

With an appropriate marketing and revenue generation scheme, Express lanes would provide an opportunity for additional funding for reinvestments within each corridor and the region to expand and complete the HOV network, improve transit facilities and services, or other congestion-reducing roadway improvements decades sooner than would be possible by using the traditional state and federal funding sources.

Overall, the proposed Express Lane Network is consistent with the Caltrans' Traffic Operations Program's goals, including preserving safety, enhancing mobility, real-time multimodal transportation system management, and providing choice and control for travelers. In addition, the Express lane network also allows Caltrans to engage in innovative solutions, potentially involving public-private sector partnerships, in addressing transportation challenges.